ORIGINAL ARTICLE

The relationship of gestational hypertension and spontaneous preterm birth: A cross sectional study

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Abstract:

Introduction: Hypertensive disorders of pregnancy (HDP), including gestational hypertension and preeclampsia, are a leading cause of maternal and perinatal morbidity and mortality worldwide. Women with a history of spontaneous preterm birth (SPTB) may be at increased risk for developing HDP in subsequent pregnancies

Objective: The aim of our study is to find the frequency of hypertension in women with a history of spontaneous preterm birth in different gestational ages and to find the effect of hypertensive disorders of pregnancy on the outcome of pregnancy

Material and Methods: A cross sectional research involving questionnaires was conducted from June 2022 till May2023 at Jinnah Medical College Hospital, Karachi and the information of 215 cases were recorded. The study population of women who delivered full term or preterm. Our primary outcome measure was presence of hypertensive disorders in a subsequent pregnancy such as pregnancy induced hypertension, preeclampsia, eclampsia, SGA, placental abruption, amniotic fluid index.

Results: There were 92 patients who delivered before 37 weeks of pregnancy (preterm) and 79 patients with Pregnancy induced hypertension (PIH). 110 of the women gave birth to low-birth-weight babies. Hypertensive and related disorders were present in 146 patients. Oligohydramnios was present in 12 (mean 12.89). The women with age less than or equal to 25 had 1.6 times increased risk of developing hypertension (P value=0.089). The ones who were uneducated (P value=0.001) and belonged to a lower socioeconomic class (P value=0.006) had 3 times increased risk. Those women with interpregnancy interval of less than 1 year had 3 times increased risk (P value=0.001) as well. The ones who did not take folic acid and vitamin D supplements had 3 times increased risk of developing hypertension (P value=0.003 ,0.001 respectively).

Conclusion: Our research findings suggest that preterm delivery increases the risk of hypertensive disorders in subsequent pregnancies, and women with a history of preterm delivery need to be closely monitored during their subsequent pregnancies. Prenatal supplementation with folic acid and vitamin-D, maintaining an interpregnancy interval of more than one year can help to reduce the risk of hypertensive disorders.

Keywords: Gestational hypertension, Pre-eclampsia, Spontaneous preterm delivery, low birth weight babies.

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Introduction:

Hypertensive disorders of pregnancy (HDP), including gestational hypertension and preeclampsia, are a leading cause of maternal and perinatal morbidity and mortality worldwide.[1] Women with a history of spontaneous preterm birth (SPTB) may be at increased risk for developing HDP in subsequent pregnancies.[2] The pathophysiology underlying these two conditions is complex and likely multifactorial, involv-

ing both genetic and environmental factors.[3]

Hypertensive disorders of pregnancy, including chronic hypertension, gestational hypertension, and preeclampsia, are well-established risk factors for preterm delivery. According to a systematic review by Ananth et al. (2013).[4] Women with chronic hypertension have a 2.5-fold increased risk of preterm delivery compared to normotensive women. Preeclampsia, a severe form of hypertension, is associated with an even higher risk of preterm delivery, with a relative risk ranging from 2.5 to 8.0 (Ananth et al., 2013).[4]

The mechanisms underlying the association between hypertension and preterm delivery are complex and multifaceted. Chronic hypertension may lead to impaired placental perfusion, resulting in inadequate oxygen and nutrient supply to the fetus, ultimately leading to preterm delivery (Ananth et al., 2013).[4] Preeclampsia, on the other hand, involves systemic endothelial dysfunction, inflammation, and abnormal placental development, all of which contribute to an increased risk of preterm delivery (Ananth et al., 2013; Haddad et al., 2019).[4,5]

Preterm delivery carries significant consequences for both the mother and the newborn. Maternal complications associated with preterm delivery include an increased risk of postpartum haemorrhage, infection, and psychological distress (Haddad et al., 2019).[5] Neonates born preterm are at higher risk of respiratory distress syndrome, intraventricularhaemorrhage, necrotizing enterocolitis, and long-term neurodevelopmental impairments (Haddad et al., 2019).[5]

Preterm birth is defined as delivery before 37 weeks of gestation and occurs in approximately 10% of all pregnancies.[6] While some cases of SPTB are related to maternal or fetal pathology, many cases are idiopathic or associated with maternal risk factors such as smoking, infections, or short interpregnancyintervals.[7] The mechanisms by which SPTB increases the risk for HDP in subsequent pregnancies are not fully understood, but may involve alterations in maternal immune function, vascular remodelling, or placental dysfunction.[8]

Several studies have explored the relationship between SPTB and HDP, with varying results.[2,9] While some studies have suggested an increased risk of HDP in women with a history of SPTB, others have not found a significant association.[2,9] The inconsistent findings may be due to differences in study design, sample size, or population characteristics.

Given the potential adverse outcomes associated with both SPTB and HDP, it is important to identify women at increased risk for these conditions and provide appropriate surveillance and management. In this article, we will review the current evidence regarding the risk of HDP in women with a history of SPTB and discuss the implications for clinical practice.

Pakistan is ranked third in terms of the burden of maternal, fetal, and child mortality. Pregnancy-related disorders were responsible for one-third of maternal deaths in women admitted for delivery in a tertiary care hospital in Pakistan. The incidence of hypertensive disorders of pregnancy is 5.56% in a tertiary care hospital in Sukkur, Pakistan. The most prevalent hypertensive disorders were preeclampsia and eclampsia.[10]

Objective: The aim of our study is to find the frequency of hypertension in women with a history of spontaneous preterm birth in different gestational ages and to find the effect of hypertensive disorders of pregnancy on the outcome of pregnancy

Material and Methods:

A cross sectional research involving questionnaires and (quantitative research) was conducted for 1 year i.e. 01.6 22 –31.5.23 and the information of 215 cases was recorded. The study population of women who delivered full term or preterm, and admitted in JMCH, Korangi, Karachi, were taken into consideration after consent with reassurance of confidentiality. Our primary outcome measure was presence of hypertensive disorders in a subsequent preg-

nancy such as pregnancy induced hypertension, preeclampsia, eclampsia, SGA, placental abruption, amniotic fluid index. The clinical diagnosis of pregnancy induced hypertension was made with a (BP≥140/90 mmHg on 2 occasions at least 4 hour apart) and preeclampsia was diagnosed with hypertension and proteinuria (≥300 mg proteinuria in 24 hours). Small for gestational age SGA was defined as a birthweight smaller than the 10th percentile for the gestational age. Abruption of the placenta is a clinical diagnosis and defined as the partial separation of the placenta from the uterine wall prior to delivery. A normal amniotic fluid index is 5 cm to 25 cm using the standard assessment method on ultrasound. Less than 5 cm is considered oligohydramnios. In case of research participants who cannot read or write, we dictated and translated our questionsafter obtaining verbal consent.

Inclusion criteria: Women who delivered spontaneously after 24 completed weeks and within 37 weeks. Women who delivered spontaneously after 37 completed weeks till 40 weeks. Women who have hypertensive disorders in pregnancy.

Exclusion criteria: Women with iatrogenic preterm birth before 37 weeks in first pregnancy. Women with pre-existing hypertension. Multiple gestations. Fetal structural abnormalities. Intrauterine fetal death. Age more than 35-years. Primigravida. History of leaking liquor.

Women were classified into two groups: Women who delivered at < 37 weeks of gestation in their first pregnancy and women who delivered at ≥37 weeks in their first pregnancy. We analysed demographic data including maternal age, weight, level of education, socio-economic status and obstetric characteristics like supplements taken during pregnancy, interpregnancy interval, vaginal discharge during pregnancy, haemoglobin, random blood sugars, amniotic fluid index, gestational age at delivery, urine tract infection during pregnancy. Education was further divided into uneducated, low, primary and high. Socio-economic status was based on the number of bread winners among the inhabitants occupying the same household, their income, number of rooms and the area they live in. The supplements included vitamin-D, folic acid, iron and calcium. Interpregnancy interval was divided into <1 year and >1 year. Vaginal discharge was categorized into greyish non itchy, white itchy and greenish itchy. Gestational age at delivery was subdivided into <37 weeks and 37-40 weeks. Urine infection occurrence was simply asked. We evaluated if hypertension, preeclampsia, SGA, abruptio placenta is present in the subsequent pregnancy following a preterm birth. Finally, the prevalence of hypertensive disorders in second pregnancy after a preterm or term delivery was determined.

We performed the univariate analyses with the student t test for the continuous variables and the $\chi 2$ test for the categorical variables to compare baseline characteristics. We tested separately for SPTB and term birth with or without hypertensive disorders, SGA and/or placental abruption in the first pregnancy. We determined the effect of risk factors on hypertensive disorders and also SGA and/or placental abruption in the second pregnancy using logistic regression modelling, expressed as odds ratios with 95% confidence interval (CI). Analysis was repeated for women without hypertensive disorders, SGA and/or placental abruption in the 1st pregnancy and with hypertensive disorders, SGA and/or placental abruption in the 1st pregnancy. All statistical tests were 2-sided; we chose a probability value of 0.05 as threshold to indicate statistical significance. Statistical analysis was conducted using SPSS version 23. Permission from the institutional ethical review committee taken prior to conduction of study.

Results:

During one-year study period, total 215 cases were taken as sample. Women were classified into two groups: Women who delivered at < 37 weeks of gestation in their first pregnancy and women who delivered at ≥37 weeks in their first pregnancy, 92 patients delivered before 37 weeks of pregnancy (preterm) and 79 patients with Pregnancy induced hypertension (PIH).

The demographic data includes maternal age,

Table 1:

Variables	Hypertension present n (%)	Hypertension absent n (%)	P value	OR (95% CI of OR)
Age			0.089	1.666
≤25	71 (74)	25 (26)		(0.925 – 3.001)
>25	75 (63)	44 (37)		
Education			<0.001	3.076
Below primary	76 (80.9)	18 (19.1)		(1.642 – 5.763)
Above primary	70 (57.9)	51 (42.1)		
Socioeconomic status			0.006	3.183
Low	43 (84.3)	8 (15.7)		(1.404 – 7.216
Average+high	103 (62.8)	61 (37.2)		
Interpregnancy interval			0.001	3.091
<1 year	61 (82.4)	13 (17.6)		(1.555 – 6.146)
>1 year	85 (60.3)	56 (39.7)		
Vaginal discharge			0.001	2.968
Present	69 (81.2)	16 (18.8)		(1.555 – 5.667)
Absent	77 (59.2)	53 (40.8)		
Folic acid			0.003	3.397
Yes	101 (62.3)	61 (37.7)		(1.502 – 7.686)
No	45 (84.9)	8 (15.1)		
Vitamin D			<0.001	3.532
Yes	41 (50.6)	40 (49.4)		(1.941 – 6.430)
No	105 (78.4)	29 (21.6)		
UTI			0.035	2.110
Present	48 (78.7)	13 (21.3)		(1.053 – 4.229)
Absent	98 (63.6)	56 (36.4)		

Table 3:

Characteristics	Mean (SD)	Correlation coefficient (r)	P value
Weight of the patient	73.52 (9.535)	0.163	0.017
Age	26.93 (4.319)	0.000	0.997
Number of supplements taken	2.88 (1.24)	-2.61	<0.001
RBS	101.71 (19.65)	0.201	0.003
Hb	10.53 (1.28)	0.091	0.184

weight, level of education, socioeconomic status and obstetric characteristics like supplements taken during pregnancy, interpregnancy interval, and vaginal discharge during pregnancy. Assessing the age; 71%(74) were less than 25 years, and 75%(63) were more than 25 years.

Table 1 shows that women with age less than or equal to 25 had 1.6 times increased risk of developing hypertension (P value=0.089). The ones who were uneducated (P value=0.001) and belonged to a lower socioeconomic class (P value=0.006) had 3 times increased risk. Those women with inter-pregnancy interval of less than 1 year had 3 times increased risk (P value=0.001) as well. Patients who presented with complaints of vaginal discharge had 2.9 times increased risk (P value=0.001) and the ones who did not take folic acid and vitamin D supplements had 3 times increased risk of developing hypertension (P value=0.003 ,0.001 respectively). The patients who presented with urinary tract infection had 2.11 times increased risk of developing hypertension (P value=0.035). P values of education, socio-economic status, interpregnancy interval, vaginal discharge, folic acid, vitamin D, UTI, were significant.

Table 2 shows the frequency, percentage and mean of the variables. From 215 women, 119 were above the age of 25 (mean 26.93). Oligohydramnios was present in 12 (mean 12.89). Only 81 patients took vitamin D supplements. There were 92 patients who delivered before 37 weeks of pregnancy (preterm) and 79 patients with Pregnancy induced hypertension (PIH). 110 of the women gave birth to low-birth-weight babies. Hypertensive and related disorders were present in 146 patients.

Table 3 shows the mean weight (73.52 kg) of the women which is positively correlated with hypertension (0.163), (P value=0.017). The mean age (26.93) is not correlated with hypertension, (P value=0.997). Number of supplements taken during pregnancy is negatively correlated with hypertension (-2.61), (P value=0.001). The RBS of the women is positively correlated with hypertension (0.201), (P value=0.003). The haemoglobin of the women is not correlated with hypertension, P value (0.184).

Discussion:

Our research findings indicate that preterm delivery is associated with an increased risk of hypertensive disorders in subsequent pregnancies. This finding is consistent with previous studies that have shown an increased risk of hyperten-

Table 2:

Variable	Frequency (N)	Percentage (%)	Mean (SD)	Median (IQR)	Standard error
Age in years			26.93 (4.319)	27 (6)	0.295
Age <=25	96	44.7			
Age >25	119	55.3			
Weight			73.52(9.535)	72 (12)	0.65
Haemoglobin			10.529 (1.28)	10.4 (1.5)	0.087
RBS			101.71 (19.65)	102 (24)	1.34
AFI			12.898 (3.056)	13 (4)	0.2085
oligohydramnios present	12	5.6			
oligohydramnios absent	203	94.4			
Vitamin D sup yes	81	37.7			
Vitamin D sup no	134	62.3			
Gestational age <37 weeks	92	42.7			
Gestational age 37-40 weeks	123	57.2			
PIH Present	79	36.7			
PIH Absent	136	63.3			
low birth weight	110	51.2			
birth weight >2.5	105	48.8			
Hypertensive and related disorders Present	146	67.9			
Hypertensive and related disorders Absent	69	32.1			

sive disorders in women with a history of preterm delivery.[11] As early diagnosis and management can reduce adverse pregnancy outcomes such women need to be closely monitored during their subsequent pregnancies for signs of hypertension.

Our study found a positive association between weight, RBS, Hb and hypertension in pregnant women with a history of preterm delivery. This is consistent with previous studies that have also found a higher risk of HDP in overweight or obese women and those with diabetes or gestational diabetes.[12,13] It is important to note that weight and glycaemic control are modifiable risk factors, highlighting the importance of preconception counselling and appropriate management of these conditions in women at high risk for preterm delivery and HDP.

As there is an association of preterm delivery with an increased risk of HDP in subsequent pregnancies,which is also consistent with other studies that have found a higher risk of HDP in women with a history of preterm delivery.[12,14,15] The underlying mechanisms of this association are not fully understood, but may involve alterations in maternal immune function, vascular remodelling, or placental dysfunction.[16] Further research is needed to better understand the pathophysiology underlying this association.

Interestingly, we also found a negative association between the total number of supplements taken during pregnancy and the risk of hypertension. Specifically, we found that women who took more supplements experienced a lower risk of hypertension. This finding is consistent with previous studies indicating that prenatal supplementation, particularly with folic acid and vitamin D, can improve pregnancy outcomes and may have a protective effect against hypertensive disorders.[17,18] Healthcare providers should encourage women to take these supplements and monitor their intake to optimize the health outcomes of mothers and fetuses. Ensuring women have access to and take appropriate supplements may be an effective way to reduce the risk of HDP in high-risk populations.

Furthermore, we found that a longer interval between pregnancies was associated with a decreased risk of hypertensive disorders. This finding is similar to a previous study that found that an interpregnancy interval of more than 18 months was associated with a lower risk of hypertension in subsequent pregnancies.[15] Such an interval allows the maternal body to recover from the physiological effects of the previous pregnancy and reduce the risk of hypertensive disorders.

Our study also identified several other risk factors for HDP in women with lower levels of education and those who have had urinary tract and vaginal infections, are at increased risk of developing hypertensive disorders during pregnancy. This is consistent with previous studies that have found that socioeconomic factors and infections

increase the risk of hypertensive disorders.[19-21] Healthcare providers need to provide education to women at higher risks, including hygiene practices and symptom recognition, to reduce the onset and severity of hypertensive disorders in pregnancy. Addressing these risk factors through appropriate education, screening, and treatment may be important in reducing the risk of HDP in this population.

Limitations: The limitation of our study is that it was conducted in a single hospital, and therefore, the results may not be generalizable to other populations. Moreover, we had a small sample size, which could limit the statistical power of our results. Future larger studies are needed to confirm our findings and better understand the modifiable risk factors for HDP in high-risk populations.

Conclusion:
In conclusion, our research findings suggest that preterm delivery increases the risk of hypertensive disorders in subsequent pregnancies, and women with a history of preterm delivery need to be closely monitored during their subsequent pregnancies. Prenatal supplementation with folic acid and vitamin D, maintaining an interpregnancy interval of more than one year, and education on hygiene practices can help to reduce the risk of hypertensive disorders. Healthcare providers should provide education to women regarding hypertensive disorders in pregnancy, early diagnosis, and management to improve maternal and fetal outcomes. Further research is needed to better understand the pathophysiology underlying this association and identify additional strategies for reducing the risk of HDP in high-risk populations.

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Role and contribution of authors:
Shazia Aftab, collected the data, references and did the initial writeup.

Samina Ayaz, helped in collecting the data and also helped in introduction writing.

Sadia Rashid, helped in collecting the references and also helped in abstract writing.

Fariha Hussain, helped in collecting the data, and also helped in discussion writing

Shazeen Fatima, critically review the article and made final changes.

Agha Saddam Hussain, collected the references and also helped in material and methods writing.

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